## **Object-Oriented Programming Language**

03/09/2023

## Due 3/10 11:59AM

## Lab Assignment 3

1. Write a program that inputs 3 triangles each with three vertices. Store them in an array, and then determine if the given triangles are right triangles (直角三角形). Here are some sample code you can use.

```
struct Vertex {
  double x;
  double y;
  };

struct Triangle {
  Vertex A;
  Vertex B;
  Vertex C;
  bool right;
  };
```

A sample run of the program is as follows:

```
Input for the 1 triangle:
        Please input the x & y coordinates of the 1st vertex: 0 3
        Please input the x & y coordinates of the 2nd vertex: 4 0
       Please input the x & y coordinates of the 3rd vertex: 0 0
Input for the 2 triangle:
       Please input the x & y coordinates of the 1st vertex: 4 4
       Please input the x & y coordinates of the 2nd vertex: 4 4
        Please input the x & y coordinates of the 3rd vertex: 3 3
Input for the 3 triangle:
       Please input the x & y coordinates of the 1st vertex: 9 7
       Please input the x & y coordinates of the 2nd vertex: 4 5
        Please input the x & y coordinates of the 3rd vertex: 12-5
Done reading Triangles.
Triangle 1 is a right triangle!
The right angle of triangle 1 is at the Vertex3
Triangle 2 is NOT a right triangle!
Triangle 3 is NOT a right triangle!
```

2. Write a C++ program that inputs certain number of triangles each with three vertices. Store them in a **vector**, and then determine if the given triangles are right triangles (直角三角形). When you access the triangles in the vector, use **iterators**. You should also use the mentioned **struct** in problem 1.

```
How many Triangles will you input? 3
Input for the 1 triangle:
        Please input the x & y coordinates of the 1st vertex: 1 1
        Please input the x & y coordinates of the 2nd vertex: 1 - 1
        Please input the x & y coordinates of the 3rd vertex: 0 0
Input for the 2 triangle:
        Please input the x & y coordinates of the 1st vertex: 1 1
        Please input the x \& y coordinates of the 2nd vertex: 2 2
        Please input the x & y coordinates of the 3rd vertex: 0 1
Input for the 3 triangle:
        Please input the x & y coordinates of the 1st vertex: 1 1
        Please input the x & y coordinates of the 2nd vertex: 1 1
        Please input the x & y coordinates of the 3rd vertex: 1 1
Done reading Triangles.
Triangle 1 is a right triangle!
Triangle 2 is NOT a right triangle!
Triangle 3 is NOT a right triangle!
```

```
How many Triangles will you input? 2
Input for the 1 triangle:

Please input the x & y coordinates of the 1st vertex: 1 1

Please input the x & y coordinates of the 2nd vertex: 1 -1

Please input the x & y coordinates of the 3rd vertex: 0 0

Input for the 2 triangle:

Please input the x & y coordinates of the 1st vertex: 1 1

Please input the x & y coordinates of the 2nd vertex: 1 1

Please input the x & y coordinates of the 3rd vertex: 1 1

Done reading Triangles.

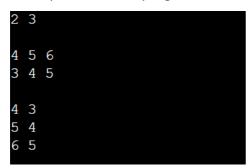
Triangle 1 is a right triangle!

Triangle 2 is NOT a right triangle!
```

3. Write a program that takes a  $(r \times c)$  matrix as input and return the transpose of the matrix.

r,c <=10

A sample run of the program is as follows:



4. Write a program that input a string and test if it is a palindrome(回文)

You can't use the reverse() in the #include <algorithm>

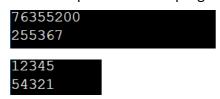
(hint: input N character, compare the first and the N-th, second and the (N-1)-th and so on)

Some sample runs of the program are as follows:



5. Write a program that input a number as a **string** and return its reverse (hint: You can use reverse() in the #include <algorithm> and there is no '0' at the beginning but the end of the input number )

Some sample runs of the program are as follows:



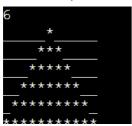
6. Write a program that input an arithmetic sequence's (等差數列) first number, last number and the common difference of successive members. Please return the whole arithmetic sequence.

Some sample runs of the program are as follows:

```
3 5 7 9
1 17 4
1 5 9 13 17
```

7. Write a program that input a number n and return a "cool" pyramid. For example, if n=3, first row has 1 \* and 4\_, second row have 3\* and 2\_, third row has only 5\*. That is, creating a  $(2n-1) \times (2n-1)$  matrix.

Some sample runs of the program are as follows:





8. There is very simple encryption method in cryptography(密碼學) which is add a certain integer K to each character of the code to obtain the characters of the password For example, if K=2, then apple becomes crrng after encryption .Write a program that input a string and return a string after encryption.

Please use K=7

Some sample runs of the program are as follows:

```
I love OOP, OOP NO:1
P'sv}l'VVW3'VVW'UVA8
IBM is a trademark of the International Business Machine Corporation.
PIT'pz'h'{yhklthyr'vm'{ol'Pu{lyuh{pvuhs'I|zpulzz'Thjopul'Jvywvyh{pvu5
```

You can copy the sample input:

I love OOP, OOP NO:1

IBM is a trademark of the International Business Machine Corporation.

(HW\_1). Write a program that input a number, return the factorization of the number A sample run of the program is as follows:

```
please input a number
999997
757^1 * 1321^1
```

(HW\_2). write a program that input a number as an **int** and return its reverse You should use only #include <iostream>

(hint: use the "%" operator and there is no '0' at the beginning but the end of the input number)

Sample runs are same to the question 5